An Evaluation of Think First Saskatchewan

A Head and Spinal Cord Injury Prevention Program

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ABSTRACT

Objectives: To identify youth behaviour with regards to injury prevention, to assess the awareness of severity and susceptibility to brain and spinal cord injury, and to evaluate the impact of the Think First Saskatchewan school visit program on students' knowledge of brain and spinal cord injury prevention.

Methods: A controlled, pre- and post-test design, self-report questionnaire was administered to 1,257 grade 6 and 7 students. Descriptive statistics and chi-square were used for data analysis. P-values less than 0.05 were considered significant.

Results: Saskatchewan youth participate in activities that put them at risk for brain and spinal cord injury. The Think First Saskatchewan school visit program statistically improved self-reported knowledge of the students receiving the Think First message.

Discussion: Think First Saskatchewan is a brain and spinal cord injury prevention program that significantly improves youth knowledge pertaining to injury prevention. Further evaluation of the program to include a more delayed survey of retention of knowledge, changes to behaviour, and reduction of brain and spinal cord injury are necessary.

For Canadian youth, injury is the prime cause of death and disability. The medical costs of caring for injury are staggering: in 1995, the total cost of injury in Canada was \$8.7 billion.¹ The highest risk of injury occurs in the 15-24 age group, and males are more frequently injured than females. Factors that put youth at higher injury risk include high speed driving, alcohol and drug use, being less inclined to use safety restraints, risk-taking behaviours and activities, and peer pressure.²⁻⁴ Motor vehicle accidents remain the leading cause of injury, but sport, recreation, violence and carelessness account for growing numbers of death and disabling injuries.⁵

Think First is a brain and spinal cord injury prevention program that was founded in the United States of America in 1986. Its aim is threefold: 1) to persuade youth they are at risk for brain and spinal cord injury, 2) to impress upon them the severity and permanence of brain and spinal cord injury, and 3) using the catch phrase "*use your head to protect your body*", to teach youth to reduce their risk of injury. The Canadian Think First program is similar to the American version, with minor modifications to increase relevance to Canadian youth. Think First Saskatchewan, a provincial chapter of the national organization, focuses its efforts on the Think First school program. A Think First educator, along with a brain- or spinal cord-injured guest speaker, addresses groups of 30-50 students aged 10-18. The one-hour presentation includes the video *On the Edge* that delivers testimonials from brain- and spinal cord-injured teens, and is followed by an educational session, with audiovisual aids, in which the students are educated more on how and why injuries occur.⁶ Students are provided with a brief description of anatomy and the concepts of pathophysiology of brain and spinal cord injury are addressed, at an age-appropriate level. With every school presentation, a person living with a brain or spinal cord injury delivers his/her own accounting of how life was changed after the injury. At the end of the session, the students are given the opportunity to ask questions, relate their personal experiences and express the application of "*thinking first*" on their everyday lives.

Wright⁷ described three levels of prevention. "First level prevention is action taken to reduce the occurrence of disability; second level prevention is intervention directed toward prevention of the development

La traduction du résumé se trouve à la fin de l'article.

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of functional limitations resulting from disabilities; and third level prevention is intervention taken to prevent the transition of irreversible functional limitations into handicaps." Think First is a primary, or first level prevention program. The literature documents the statistically significant enhancement of knowledge that primary prevention programs can effect.^{4,8-16} The underlying assumption of a prevention program, though difficult to prove, is that changing/increasing knowledge will result in an alteration of behaviour. The PARTY program is currently attempting a prospective longitudinal study designed to evaluate behaviour changes as a result of the program.⁹ Neuwelt et al.¹¹ demonstrated a statistically significant increase in knowledge following the presentation of an educational spinal cord injury prevention program in Oregon, however, they failed to demonstrate an alteration in attitude or behaviour in the high school students they surveyed. They hypothesized that a reinforcement program may be required to accompany the primary prevention to solidify the knowledge and alter behaviour. Despite this, educational interventions are important for altering behaviour, and are effective at creating change.

This study was designed to assess the effectiveness of the Think First school visit program on increasing the knowledge of youth regarding brain and spinal cord injury as well as injury prevention. Outcomes examined were multi-factorial: to identify youth behaviours as they relate to injury prevention, and to examine students' awareness of susceptibility to and severity of brain and spinal cord injury.

METHOD

This was an observational cross-sectional study. From the list of Separate and Public elementary schools in Regina scheduled to receive the Think First school program, all schools to be visited between November 24, 1997, and March 24, 1998 were included in the study group. This comprised 25 classes in 15 schools. As Saskatoon students were not receiving the benefit of the Think First school program, 20 classes, demographically matched for age, grade and socioeconomic background from the Separate and Public schools in Saskatoon, served as the control group for

TABLE I

Demographic Characteristics of Pre- and Post-test Respondents in Regina and Saskatoon

	Regina		Saskatoon	
	Pre-test	Post-test	Pre-test	Post-test
Gender				
Female	166	141	142	148
Male	184	139	171	165
Total	350	279	313	313
Grade				
6	223	179	149	150
7	127	100	164	163

TABLE II

Risk-taking Behaviours of Regina and Saskatoon Students – Percentage of Students Responding "Yes"

	Regina		Saskatoon	
	Pre-test	Post-test	Pre-test	Post-test
Risk Behaviour				
Have a bicycle	95.4%	97.1%	93.3%	94.4%
Have a bicycle helmet	74.0%	77.8%	81.1%	79.6%
Wear a helmet every time ride bike	32.6%	40.1%	40.9%	40.0%
Have rollerblades	70.6%	72.8%	66.5%	68.4%
Wear protective gear every time rollerblade	16.6%	22.9%	23.6%	20.5%
Have skateboard	23.1%	27.2%	24.9%	26.5%
Wear protective gear every time skateboard	1.4%	3.9%	3.4%	3.5%
Do not wear seatbelts	3.1%	2.6%	4.8%	7.4%

this study. Participation in the study was voluntary and in accordance with the ethical standards of the Regina Health District ethics committee. A non-identifying, self-report questionnaire was used to measure student demographics, risk-taking behaviour, and general knowledge of causes, susceptibility and prevention of brain and spinal cord injury. The questionnaire was distributed by the classroom teacher one week prior to, and two weeks following the Think First school visit. The matched control students in Saskatoon completed the questionnaires during the same four-month time span as their Regina counterparts.

To avoid compounding bias, the curriculum taught in the Regina and Saskatoon separate and public school systems was analyzed to determine similarity. They were found to be analogous. Individual classroom teachers were polled to ensure that lessons pertaining to injury prevention had not been taught in the school year preceding the Think First presentation. No confounding problems of this nature were identified, and all 25 classes in the study group and 20 classes in the control group were included for analysis.

Analysis

Demographical and risk-taking behaviour questions included in the questionnaire were examined with descriptive statistics. The pre- and post-visit general knowledge

questions were analyzed individually using chi-square analysis. A p-value of 0.05 or less was considered significant. Twenty-two questionnaires were completed contrary to the instructions and were therefore discarded. In total, 1,834 correctly completed questionnaire responses were received. To decrease possible bias due to age, education and skewed sample size, the analysis was limited to 1,257 responses from grade six and seven students.

Demographics

The demographic characteristics of the sample are presented in Table I. The differences in gender response rates for the Regina and Saskatoon cohorts were not statistically significant ($p=0.49$, 0.63 respectively), therefore the study population is considered to be representative of the general population.

Risk-taking behaviours

The majority of youth participated in risk-taking behaviours, often without appropriate protective equipment. For example, the majority of respondents had a bicycle, yet only 74-81% of the subjects had a bicycle helmet. Even fewer (33-40%) students reported wearing their helmet each time they rode their bicycle. For the students who received the Think First intervention, a statistically significant ($p=0.05$) increase in the number of respondents indicating consistent use of bike helmets was found.

TABLE III
Differences in Female/Male Risk-taking Behaviour

		Regina		Saskatoon		P-Value
		Pre-test n (%)	Post-test n (%)	Pre-test n (%)	Post-test n (%)	n (%)
Wear a bicycle helmet every time	F	67 (40.4%)	64 (45.4%)	61 (43.0%)	56 (37.8%)	p>0.05
	M	47 (25.5%)	48 (34.5%)	67 (39.2%)	66 (40.0%)	p=0.025
Wear equip. to rollerblade	F	32 (19.3%)	34 (24.1%)	34 (24.0%)	31 (21.0%)	p>0.05
	M	26 (14.1%)	29 (20.7%)	40 (23.4%)	29 (20.7%)	p=0.005
Wear equip. to skateboard	F	1 (0.60%)	1 (0.71%)	1 (0.70%)	2 (1.4%)	p>0.05
	M	3 (1.6%)	10 (7.2%)	11 (6.4%)	9 (5.5%)	p=0.001
Do not wear seatbelts	F	2 (1.2%)	1 (1.4%)	1 (0.70%)	7 (4.7%)	p=0.005
	M	9 (4.9%)	5 (3.6%)	14 (8.2%)	16 (9.7%)	p>0.05

TABLE IV
Correct Responses to Pre- and Post-test General Knowledge Questions of Regina Students

	Pre-test	Post-test	P-Value
Motor vehicle accidents #1 cause of B & SCI*	132 (37.7%)	170 (61.0%)	< 0.001
15-24 yr. age at highest risk for B & SCI†	150 (42.9%)	227 (81.4%)	< 0.001
Helmets very effective in preventing motorcycle injuries†	172 (49.1%)	175 (62.7%)	< 0.001
Laws re: use of helmets on motorcycles	262 (74.9%)	208 (74.5%)	0.71
Laws re: use of helmets on bicycles	227 (64.9%)	175 (62.7%)	0.54
No cure for severe brain injuries†	211 (60.3%)	194 (69.4%)	0.022
Brain injury affects walking, speaking, thinking	309 (88.3%)	260 (93.2%)	0.75
Paralysis not only when spinal cord transected	244 (69.7%)	181 (64.9%)	0.21
Spinal cord is delicate like jello†	50 (14.3%)	67 (24.1%)	0.002
Sudden damage to spinal cord is permanent†	166 (47.4%)	198 (71.0%)	< 0.001
Lose bowel, bladder, walk and arm use with SCI†	227 (64.9%)	230 (82.4%)	< 0.001
Call 9-1-1 and keep victim still at car accident	241 (68.9%)	208 (74.6%)	0.15
Keep face up in water and call 9-1-1 at diving accident†	143 (40.9%)	182 (65.2%)	< 0.001

* Brain and Spinal Cord Injury

† Statistically significant alterations in knowledge as a result of the Think First school visit program.

TABLE V
Correct Responses to Pre- and Post-test General Knowledge Questions of Saskatoon Students

	Pre-test	Post-test	P-Value
Motor vehicle accidents #1 cause of B & SCI*	151 (48.2%)	134 (42.8%)	0.17
15-24 yr. age at highest risk for B & SCI	95 (30.4%)	100 (31.9%)	0.67
Helmets very effective in preventing motorcycle injuries	124 (39.6%)	118 (37.7%)	0.62
Laws re: use of helmets on motorcycles	243 (77.6%)	245 (78.3%)	0.85
Laws re: use of helmets on bicycles	237 (75.7%)	218 (69.6%)	0.08
No cure for severe brain injury	215 (68.7%)	205 (65.5%)	0.40
Brain injury affects walking, speaking, thinking	255 (81.5%)	249 (79.6%)	0.54
Paralysis not only when spinal cord transected	201 (64.2%)	201 (64.2%)	0.91
Spinal cord is delicate like jello	46 (14.7%)	55 (17.6%)	0.33
Sudden damage to spinal cord is permanent	118 (37.7%)	134 (42.8%)	0.19
Lose bowel, bladder, walk and arm use with SCI	176 (56.2%)	180 (57.5%)	0.75
Call 9-1-1 and keep victim still at car accident	216 (69.0%)	209 (66.8%)	0.55
Keep face up in water and call 9-1-1 at diving accident	119 (38.0%)	151 (48.2%)	0.01

* Brain and Spinal Cord Injury

Table II illustrates the descriptive statistics of the study subjects' risk-taking behaviours.

The majority of the students surveyed have rollerblades. While a greater percentage of the control group wore protective gear every time they went rollerblading, the Regina students indicated a statistically significant increase in the use of protective gear following the Think First presentation ($p=0.049$).

Fewer students had skateboards and even fewer utilized protective equipment each time they skateboarded. The Regina cohort of students indicated a statistically significant increase in the use of protective

gear when skateboarding following the Think First school visit ($p=0.01$).

The risk-taking behaviour data were analyzed to compare male and female differences. There was no statistically significant difference found for usage of protective sporting equipment or seatbelts between male and female respondents. Table III outlines the different male/female responses for the various risk-taking behaviours analyzed.

General knowledge

The 13 general knowledge questions were analyzed individually to determine statistically significant gains in knowledge as a

result of the Think First school visit program. Appendix one illustrates the questionnaire distributed to the students for assessing the effectiveness of the Think First school visit program. Statistically significant alterations in knowledge were found for 8 of the 13 general knowledge questions following the Think First intervention (see Table IV). Four of the 13 questions failed to demonstrate a statistically significant change in knowledge, but the Think First intervention in the study group did cause a positive trend towards more correct responses. Table IV highlights the percentage of correct responses of the Regina students who received the

Think First school visit; Table V details responses for the Saskatoon control group.

DISCUSSION

The membership of Think First Saskatchewan is a small but dedicated group of health professionals, and brain- and spinal cord-injured guest speakers who believe there is a need for a primary prevention program to teach youth of the severity and permanence of brain and spinal cord injury. The Think First educators utilize the catch phrase "use your head to protect your body" to help impart their message of injury prevention. This study demonstrated that Saskatchewan youth participate in activities that put them at risk for brain and spinal cord injury, and that the Think First program was effective at altering youth's knowledge and behaviour pertaining to injury prevention and high-risk activities.

There are a number of possible reasons for the slight difference in pre- and post-visit response rates. Account was not taken of student absenteeism when the pre- and post-visit questionnaires were distributed for completion. As the questionnaires were voluntary and self-administered, self-selection bias may have been a factor influencing response rates. It is possible that the attitudes and knowledge regarding brain and spinal cord injury of the participants who completed the post-visit questionnaire varied from students who refrained from completing the survey. This study relied on the classroom teacher distributing the questionnaires. It is possible that the importance of completion of both the pre- and post-visit surveys was not impressed upon the students by the teachers, thus negatively affecting the response rate. Despite these factors, the variance between the pre- and post-visit responses was not statistically significant and the study groups were considered to represent the same sample.

The majority of respondents owned bicycles and rollerblades, but only a minority of students wore protective gear when utilizing their sporting equipment. This study demonstrated a statistically significant increase in the reported use of protective sporting equipment following the Think First school visit. The Think First program teaches effective use of appropri-

ate protective equipment for all sports, and encourages adherence to the rules of the game to ensure safe and enjoyable participation for all players.

This study did not demonstrate a difference in risk-taking behaviour between male and female respondents. In focusing the Think First intervention on grade six and seven students, an audience with potentially alterable behaviours has been targeted. The Think First program may help to develop safer behaviours, rather than attempt to alter pre-existing practices.

When the general knowledge questions were considered together as a group, it is evident that Think First Saskatchewan met its objective in effecting a positive alteration to youth knowledge of both their susceptibility for, and permanence and severity of brain and spinal cord injury. This study did not consider student absenteeism when collecting the data. It is possible that even more relevant data demonstrating a greater statistical significance may be obtained by ensuring that all students completing the pre-test questionnaire are present at the Think First school visit, and that only those students complete the post-test survey. The use of identifying questionnaires would enable the evaluation of knowledge gain on an individual basis, rather than group assessment.

The Think First school visit program had been active in Regina for three years at the time of this study. This may contribute to the greater percentage of correct responses to the pre-test general knowledge questions from the Regina cohort, compared to the Saskatoon control group. It is possible that some of the respondents from Regina had received the Think First message in prior years. The classroom teachers were polled to ensure that no other prevention teaching was imparted in the school curriculum. Thus, it was determined that the only intervention received in the school was that of Think First.

The Think First website and e-mail address were included on the questionnaire for both Regina and Saskatoon students. It is possible that the difference between pre- and post-test responses for the Saskatoon group were positively affected by students' self-education on the world wide web to learn more about injury risk and prevention. Although this was recognized as a possible confounding variable, it was felt to

be potentially more important to disseminate Think First's message of brain and spinal cord injury prevention than to place more stringent limits on this factor.

Self-administered questionnaires rely upon truthful reporting of responses. It is possible that a self-selection bias was present, affecting the pre- and post-test outcomes. Varying attitudes towards acceptance of risk, and of brain and spinal cord injury prevention may have influenced the responses. Adolescents who were contrary towards education may deliberately sabotage the accurate reporting of true knowledge. By limiting the analysis to grades six and seven students, this study limited the variance of level of education, life experiences, and peer pressure on the responses received.

CONCLUSIONS

This evaluation of Think First Saskatchewan demonstrated statistically significant alterations in self-reported knowledge of the students receiving the Think First message. Although changes in knowledge do not always effect changes in behaviour, it is, nonetheless, an important first step in educating youth and working towards improved attitudes and behaviours that will prevent injury. Further evaluation of the program may include a more delayed survey of students' knowledge retention at six and/or twelve months post-visit. This would enable a better perspective of the true alteration of knowledge as a result of the Think First program, and would negate some of the short-term influence of the intervention. A prospective study to evaluate future alterations of behaviour and percentage decrease in brain and spinal cord injuries resultant from gain in knowledge imparted by the Think First program is the ultimate evaluation of its effectiveness.

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Appendix One

Think First Saskatchewan Elementary School Program Knowledge Questionnaire

PLEASE PROVIDE THE FOLLOWING NONIDENTIFYING INFORMATION:

CITY: _____ DATE OF BIRTH: _____/_____/_____
(day) (month) (year)

YEAR IN SCHOOL: _____ 4th grade
_____ 5th grade
_____ 6th grade
_____ 7th grade

SEX: _____ female _____ male

WHERE DO YOU LIVE: _____ rural - in the country
_____ urban - in the city
_____ suburbs - outside the city

CHECK THE RESPONSES THAT ARE APPLICABLE:

- _____ I have a bicycle.
- _____ I have a bicycle helmet.
- _____ I wear my helmet every time I ride my bike.
- _____ I have taken a bicycle safety training course.
- _____ I have rollerblades.
- _____ I wear a helmet, knee pads and wrist guards every time I rollerblade.
- _____ I have a skateboard.
- _____ I wear a helmet, knee pads and wrist guards every time I skateboard.

PLEASE READ THE FOLLOWING QUESTIONS CAREFULLY AND CIRCLE THE ONE RESPONSE WHICH BEST DESCRIBES YOUR ANSWER.

1. THE NUMBER ONE CAUSE OF HEAD AND SPINAL INJURY IS:
 - a) Diving
 - b) Gunshot wounds
 - c) Falls
 - d) Motor vehicle accidents
 - e) Sport activities
2. WHAT AGE GROUP IS AT HIGHEST RISK OF HAVING A HEAD OR SPINAL CORD INJURY?
 - a) 0-14 years
 - b) 15-24 years
 - c) 25-44 years
 - d) 45-64 years
 - e) 65 years and older
3. IN WHAT TYPE OF VEHICLE DO YOU MOST OFTEN RIDE/DRIVE?
 - a) Motorcycle
 - b) Car
 - c) Pickup
 - d) Van (full-size, mini-van)
 - e) Sport Utility (i.e., Cherokee, Blazer, Pathfinder...)
 - f) Jeep (Wrangler, Suzuki Samari, Geo Tracker...)
4. HOW OLD WERE YOU WHEN YOU STARTED WEARING A SEATBELT?
 - a) I don't wear a seatbelt.
 - b) Less than 6 years of age.
 - c) 6-10 years of age.
 - d) 11-14 years of age.
 - e) 15 years or older.
5. HOW EFFECTIVE ARE HELMETS IN PREVENTING SERIOUS HEAD INJURY ON MOTORCYCLES?
 - a) Very effective in preventing head injury.
 - b) Somewhat effective in preventing head injury.
 - c) No effect at all.
 - d) Helmets can cause head injury.
6. ARE YOU AWARE OF LAWS REGARDING THE USE OF HELMETS FOR MOTORCYCLES?

_____ YES _____ NO
7. ARE YOU AWARE OF LAWS REGARDING THE USE OF HELMETS FOR BICYCLES?

_____ YES _____ NO
8. DO YOU KNOW ANYONE WHO HAS A HEAD OR SPINAL CORD INJURY?

_____ YES _____ NO
9. SEVERE BRAIN INJURIES CAN BE CURED THROUGH:
 - a) Surgery
 - b) Medications
 - c) Physical therapy
 - d) There is no cure
10. SEVERE HEAD INJURIES CAN CAUSE DIFFICULTIES WITH:
 - a) Walking
 - b) Speaking
 - c) Thinking and remembering
 - d) All of these
11. PARALYSIS DUE TO A SPINAL CORD INJURY OCCURS ONLY WHEN THE SPINAL CORD IS CUT COMPLETELY THROUGH.

_____ Agree _____ Disagree
12. THE SPINAL CORD IN THE HUMAN BODY IS:
 - a) Rubbery like a hose.
 - b) Delicate like jello.
 - c) Brittle like glass.
 - d) Strong like muscle tissue.
13. SUDDEN AND COMPLETE DAMAGE TO YOUR SPINAL CORD IS:
 - a) Permanent
 - b) Always curable
 - c) Temporary
 - d) Rarely curable
 - e) Don't know
14. SPINAL CORD INJURY CAN CAUSE LOSS OF:
 - a) Bowel and bladder function
 - b) Ability to walk
 - c) Ability to use arms
 - d) All of the above
 - e) None of the above
15. WHAT SHOULD YOU DO AT THE SCENE OF A CAR ACCIDENT?
 - a) Remove victim from car and call 9-1-1
 - b) Call 9-1-1 and keep victim still
 - c) Put a pillow under the victim's head and call 9-1-1
 - d) Try to straighten out the victim's head and call 9-1-1
 - e) Don't know
16. IF YOU COME UPON A PERSON WHO WAS INJURED FROM A DIVING ACCIDENT, WHAT SHOULD YOU DO?
 - a) Pull the person out of the water and call 9-1-1
 - b) Keep the person in the water, face up, and call 9-1-1
 - c) Take the person to the hospital
 - d) Pull the person into a boat and call 9-1-1
 - e) Don't know

"When meditating over a disease, I never think of finding a remedy for it, but, instead, a means of preventing it."
Louis Pasteur

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RÉSUMÉ

Objectifs : Définir le comportement des jeunes en matière de prévention des blessures, afin d'évaluer leurs connaissances de la gravité des blessures au cerveau et à la moelle épinière et de leur vulnérabilité à ces blessures, et d'évaluer les incidences du programme de visites scolaires Think First Saskatchewan sur les connaissances, chez les élèves, des mesures de prévention de cette catégorie de blessures.

Méthode : Des questionnaires préliminaires et de vérification, auto-administrés sous surveillance, ont été remplis par 1 257 élèves de 6^e et 7^e année. Les données ont été analysées par statistique descriptive et analyse du khi-carré. Les valeurs *P* inférieures à 0,05 ont été jugées significatives.

Résultats : Les jeunes de la Saskatchewan s'adonnent à des activités qui les rendent vulnérables aux blessures au cerveau et à la moelle épinière. Le programme de visites scolaires Think First Saskatchewan a statistiquement amélioré les connaissances déclarées des élèves ayant reçu le message « Think First ».

Discussion : Think First Saskatchewan est un programme qui améliore sensiblement les connaissances des jeunes en matière de prévention des blessures. Il faut cependant en poursuivre l'évaluation en ajoutant un questionnaire différé pour évaluer la rétention des connaissances, les modifications du comportement et la réduction des blessures au cerveau et à la moelle épinière.

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